

Author's Accepted Manuscript

Thermo-mechanical analysis of functionally graded plate-like nanorotors: A surface elasticity model

Keivan Kiani



PII: S0020-7403(15)00413-0

DOI: <http://dx.doi.org/10.1016/j.ijmecsci.2015.11.029>

Reference: MS3160

To appear in: *International Journal of Mechanical Sciences*

Received date: 25 July 2015

Revised date: 24 September 2015

Accepted date: 21 November 2015

Cite this article as: Keivan Kiani, Thermo-mechanical analysis of functionally graded plate-like nanorotors: A surface elasticity model, *International Journal of Mechanical Sciences*, <http://dx.doi.org/10.1016/j.ijmecsci.2015.11.029>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Thermo-mechanical analysis of functionally graded plate-like nanorotors: A surface elasticity model

Keivan Kiani^{a,*}

^a*Department of Civil Engineering, K.N. Toosi University of Technology,
P.O. Box 15875-4416, Tehran, Iran*

Abstract

Nanorotors could have many applications in nanotechnology, however, their thermo-elasto-static responses due to rotary motion as well as externally applied loads have not been examined yet. This paper deals with thermo-elastic fields of rotating functionally graded nanoscale plate-like rotors using the surface elasticity theory of Gurtin and Murdoch. By dividing the nanoplate into adequate number of annular rings, the analytical expressions of elastic fields within these rings are appropriately derived. Due to the symmetry of both thermal loading and the exerted centrifugal force, the elastic field is symmetric and each ring has only two unknown parameters. To determine these parameters, appropriate boundary conditions at the interfaces of the rings as well as the non-classical conditions at the innermost and outermost surfaces of the nanoplate are defined and enforced. In a particular case, the obtained results are checked with those of another work and a good agreement is achieved. The roles of the environment's temperature, angular velocity, power-law index, and surface energy effect on the resulted thermo-elastic fields are carefully studied. This work can be regarded as a crucial step in nanomechanical assessing of advanced composite nanorotors.

Keywords: Nanorotor; Rotating annular nanoplate; Functionally graded materials; Thermo-mechanical analysis; Surface effect.

*Corresponding author. Tel: +98 21 88779473; Fax: +98 21 88779476.

Email address: k_kiani@kntu.ac.ir; keivankiani@yahoo.com (Keivan Kiani)

Download English Version:

<https://daneshyari.com/en/article/7174157>

Download Persian Version:

<https://daneshyari.com/article/7174157>

[Daneshyari.com](https://daneshyari.com)